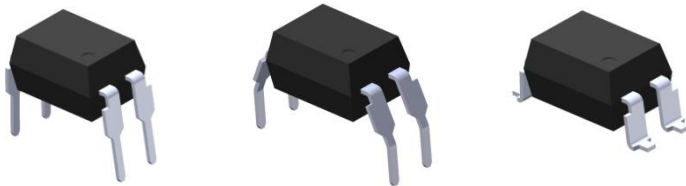
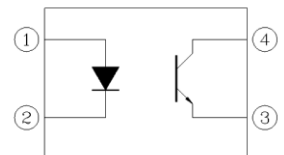


### 4 PIN DIP HIGH VOLTAGE PHOTOTRANSISTOR PHOTOCOUPLER EL851 Series



Schematic



Pin Configuration

1. Anode
2. Cathode
3. Emitter
4. Collector

#### Features:

- High collector- emitter voltage ( $V_{CEO} = 350V$ )
- Current transfer ratio  
(CTR: 50~600% at  $I_F = 5mA$ ,  $V_{CE} = 5V$ )
- High isolation voltage between input and output ( $V_{iso} = 5000 V_{rms}$ )
- Compact dual-in-line package
- Pb free and RoHS compliant.
- Compliance with EU REACH
- UL approved (No. E214129)
- VDE approved (No. 132249)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved
- CQC approved

#### Description

The EL851 series devices consist an infrared emitting diodes, optically coupled to a phototransistor detector.

The devices are in a 4-pin DIP package and available in wide-lead spacing and SMD option.

#### Applications

- Telephone line interface
- Interface to power supply circuit
- Controller for SSRs. DC motor
- Programmable Controllers

### Absolute Maximum Ratings (Ta=25°C)

|                                     | Parameter                        | Symbol    | Rating     | Unit  |
|-------------------------------------|----------------------------------|-----------|------------|-------|
| Input                               | Forward current                  | $I_F$     | 60         | mA    |
|                                     | Peak forward current (1μs pulse) | $I_{FM}$  | 1          | A     |
|                                     | Reverse voltage                  | $V_R$     | 6          | V     |
|                                     | Power dissipation                | $P_D$     | 100        | mW    |
| Output                              | Collector power dissipation      | $P_C$     | 150        | mW    |
|                                     | Collector-Emitter voltage        | $V_{CEO}$ | 350        | V     |
|                                     | Collector Current                | $I_C$     | 50         | mA    |
|                                     | Emitter-Collector voltage        | $V_{ECO}$ | 7          | V     |
| Total Power Dissipation             |                                  | $P_{TOT}$ | 200        | mW    |
| Isolation Voltage* <sup>1</sup>     |                                  | $V_{ISO}$ | 5000       | V rms |
| Operating Temperature               |                                  | $T_{OPR}$ | -55 to 100 | °C    |
| Storage Temperature                 |                                  | $T_{STG}$ | -55 to 125 | °C    |
| Soldering Temperature* <sup>2</sup> |                                  | $T_{SOL}$ | 260        | °C    |

Notes:

\*1 AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1, 2 are shorted together, and pins 3, 4 are shorted together.

\*2 For 10 seconds

## Electro-Optical Characteristics (Ta=25°C unless specified otherwise)

### Input

| Parameter         | Symbol   | Min. | Typ. | Max. | Unit          | Condition                |
|-------------------|----------|------|------|------|---------------|--------------------------|
| Forward Voltage   | $V_F$    | -    | 1.2  | 1.4  | V             | $I_F = 10\text{mA}$      |
| Reverse Current   | $I_R$    | -    | -    | 10   | $\mu\text{A}$ | $V_R = 5\text{V}$        |
| Input capacitance | $C_{in}$ | -    | 30   | 250  | pF            | $V = 0, f = 1\text{kHz}$ |

### Output

| Parameter                           | Symbol     | Min | Typ. | Max. | Unit | Condition                             |
|-------------------------------------|------------|-----|------|------|------|---------------------------------------|
| Collector-Emitter dark current      | $I_{CEO}$  | -   | -    | 100  | nA   | $V_{CE} = 200\text{V}$                |
| Collector-Emitter breakdown voltage | $BV_{CEO}$ | 350 | -    | -    | V    | $I_C = 0.1\text{mA}$                  |
| Emitter-Collector breakdown voltage | $BV_{ECO}$ | 7   | -    | -    | V    | $I_E = 0.1\text{mA}$                  |
| Collector-Emitter capacitance       | $C_{CE}$   | -   | 10   | -    | pF   | $V_{CE} = 0\text{V}, f = 1\text{MHz}$ |

### Transfer Characteristics

| Parameter                            | Symbol        | Min       | Typ. | Max. | Unit          | Condition                                               |
|--------------------------------------|---------------|-----------|------|------|---------------|---------------------------------------------------------|
| Current Transfer Ratio               | CTR           | 50        | -    | 600  | %             | $I_F = 5\text{mA}, V_{CE} = 5\text{V}$                  |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | -         | -    | 0.4  | V             | $I_F = 20\text{mA}, I_C = 1\text{mA}$                   |
| Isolation resistance                 | $R_{IO}$      | $10^{11}$ | -    | -    | $\Omega$      | $V_{IO} = 500\text{Vdc}$                                |
| Input-output capacitance             | $C_{IO}$      | -         | 0.6  | -    | pF            | $V_{IO} = 0, f = 1\text{MHz}$                           |
| Rise time                            | $t_r$         | -         | 4    | 18   | $\mu\text{s}$ | $V_{CE} = 2\text{V}, I_C = 2\text{mA}, R_L = 100\Omega$ |
| Fall time                            | $t_f$         | -         | 5    | 18   | $\mu\text{s}$ |                                                         |

\* Typical values at  $T_a = 25^\circ\text{C}$

## Typical Electro-Optical Characteristics Curves

Figure 1. Forward Current vs Forward Voltage

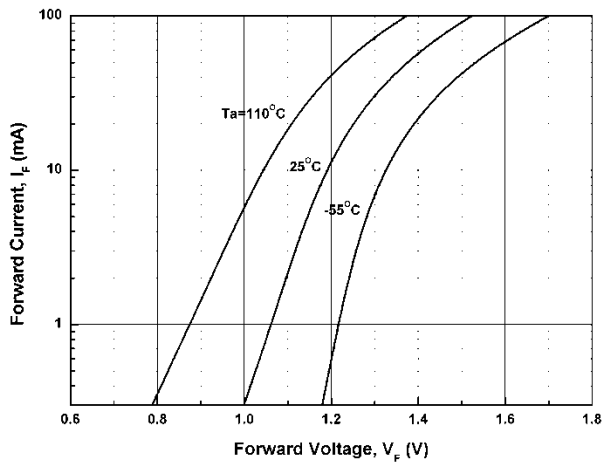


Figure 2. Current Transfer Ratio vs Forward Current

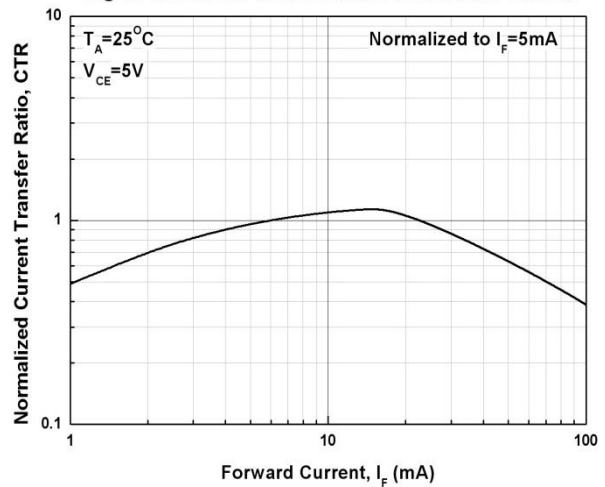


Figure 3. Collector Current vs Collector-emitter Voltage

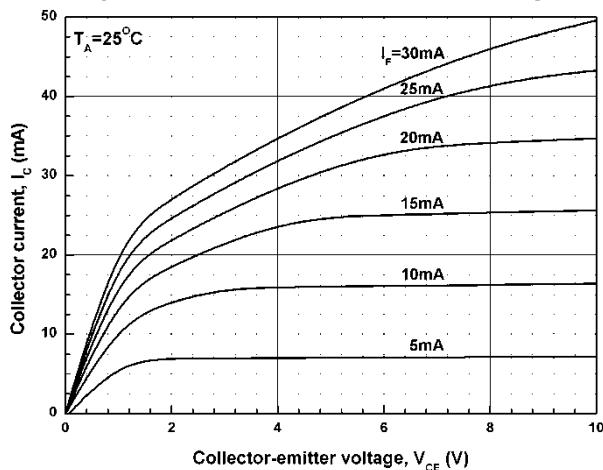


Figure 4. Relative Current Transfer Ratio vs Ambient Temperature

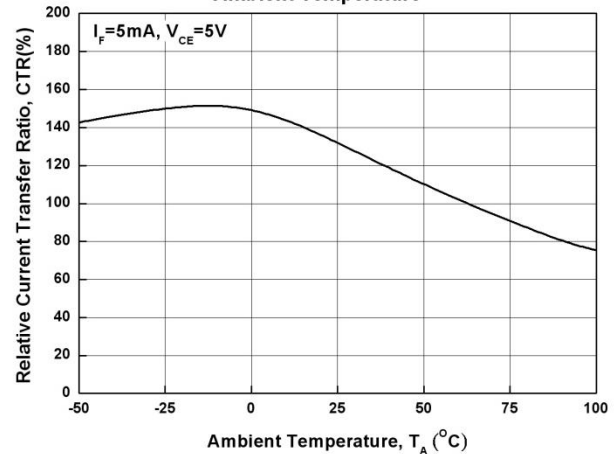


Figure 5. Collector-emitter Saturation Voltage vs Ambient Temperature

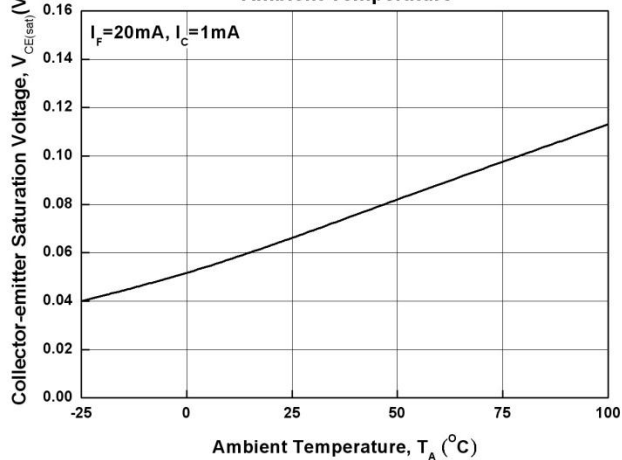


Figure 6. Dark Current vs Ambient Temperature

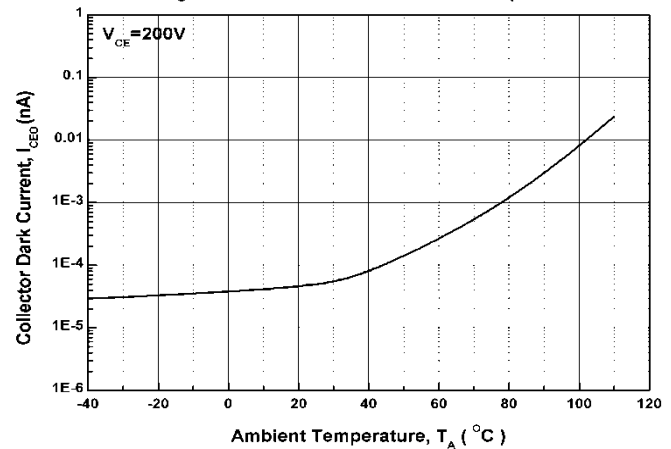


Figure .7 Switching Time vs. Load Resistance

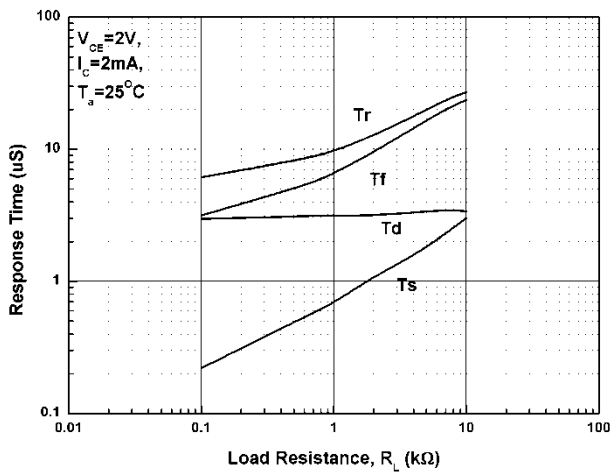


Figure 8. Collector-emitter Saturation Voltage vs Forward Current

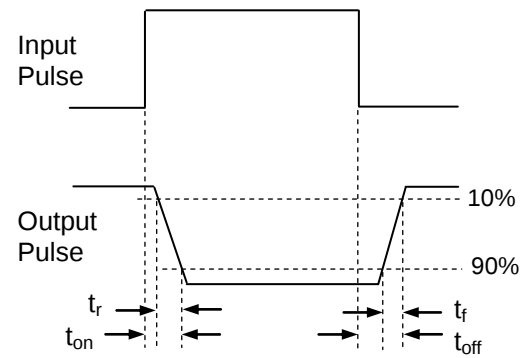
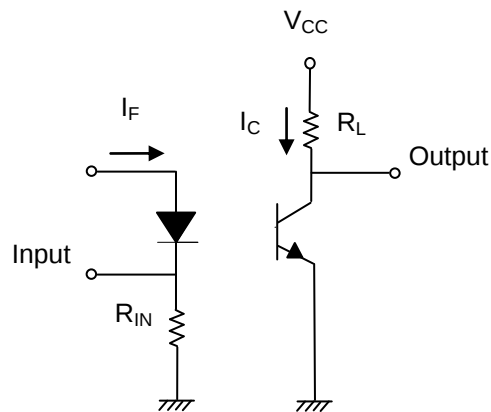
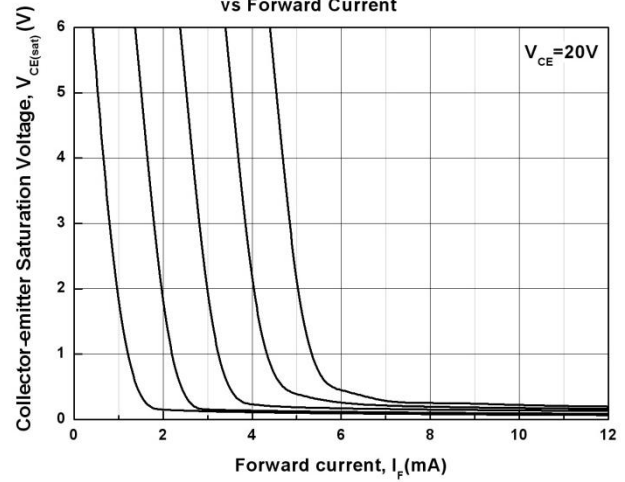


Figure 9. Switching Time Test Circuit & Waveforms

## Order Information

### Part Number

**EL851X(Z)-V**

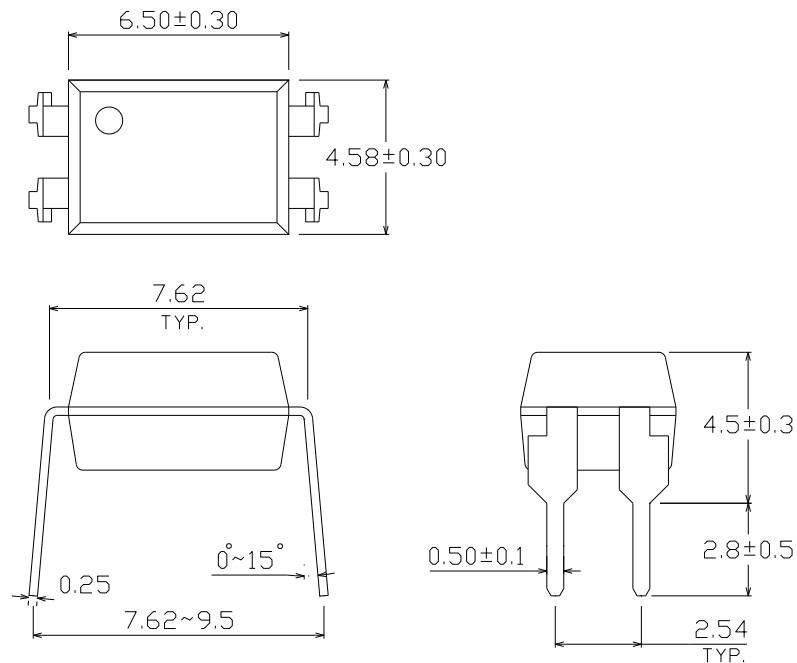
### Note

- X = Lead form option (S, S1, M or none)  
Z = Tape and reel option (TA, TB, TU, TD or none)  
V = VDE safety (optional)

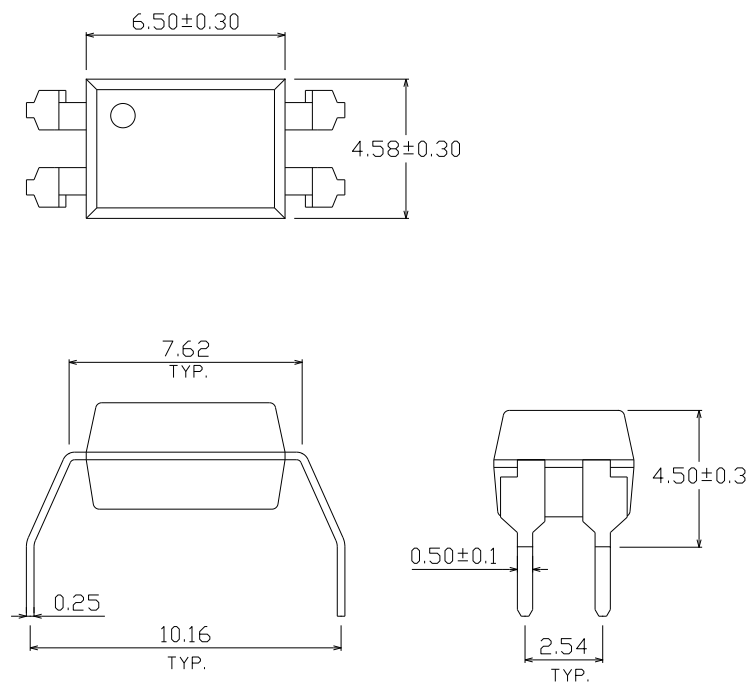
| Option  | Description                                                   | Packing quantity    |
|---------|---------------------------------------------------------------|---------------------|
| None    | Standard DIP-4                                                | 100 units per tube  |
| M       | Wide lead bend (0.4 inch spacing)                             | 100 units per tube  |
| S (TA)  | Surface mount lead form + TA tape & reel option               | 1000 units per reel |
| S (TB)  | Surface mount lead form + TB tape & reel option               | 1000 units per reel |
| S1 (TA) | Surface mount lead form (low profile) + TA tape & reel option | 1000 units per reel |
| S1 (TB) | Surface mount lead form (low profile) + TB tape & reel option | 1000 units per reel |
| S (TU)  | Surface mount lead form + TU tape & reel option               | 1500 units per reel |
| S (TD)  | Surface mount lead form + TD tape & reel option               | 1500 units per reel |
| S1 (TU) | Surface mount lead form (low profile) + TU tape & reel option | 1500 units per reel |
| S1 (TD) | Surface mount lead form (low profile) + TD tape & reel option | 1500 units per reel |

**Package Dimension (Dimensions in mm)**

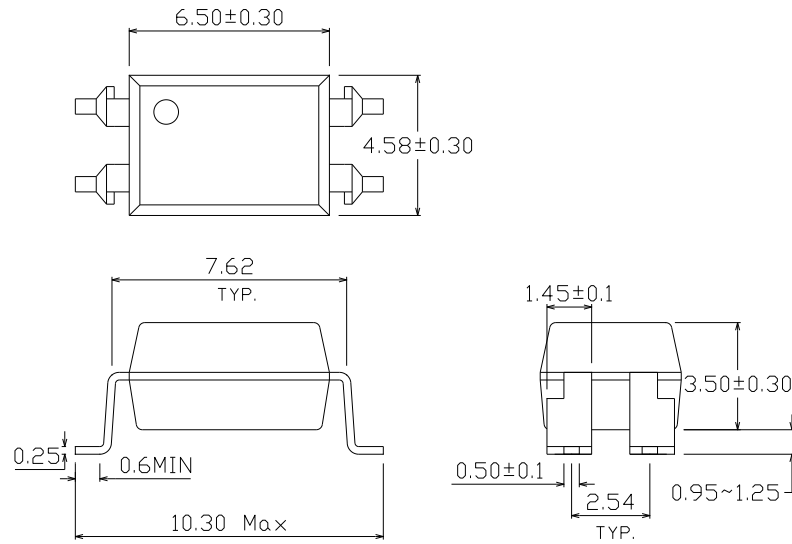
**Standard DIP Type**



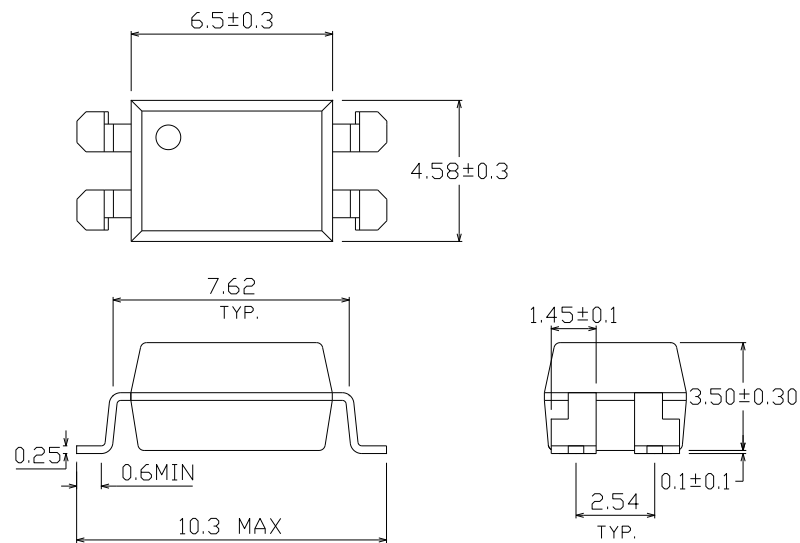
**Option M Type**



**Option S Type**

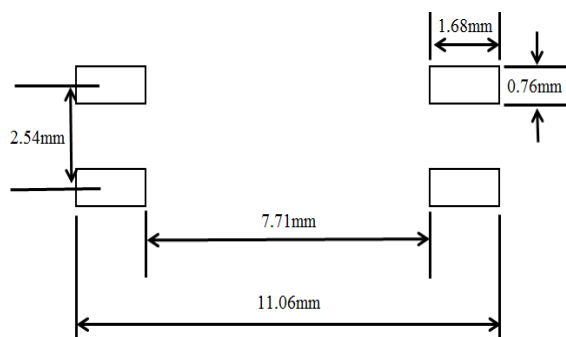


**Option S1 Type**

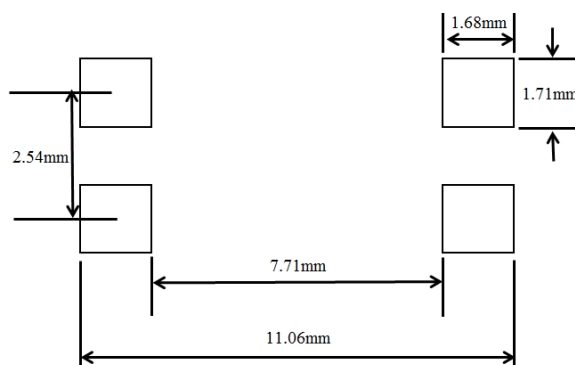


## Recommended pad layout for surface mount leadform

### For S option



### For S1 option



### Notes

Suggested pad dimension is just for reference only.  
Please modify the pad dimension based on individual need.

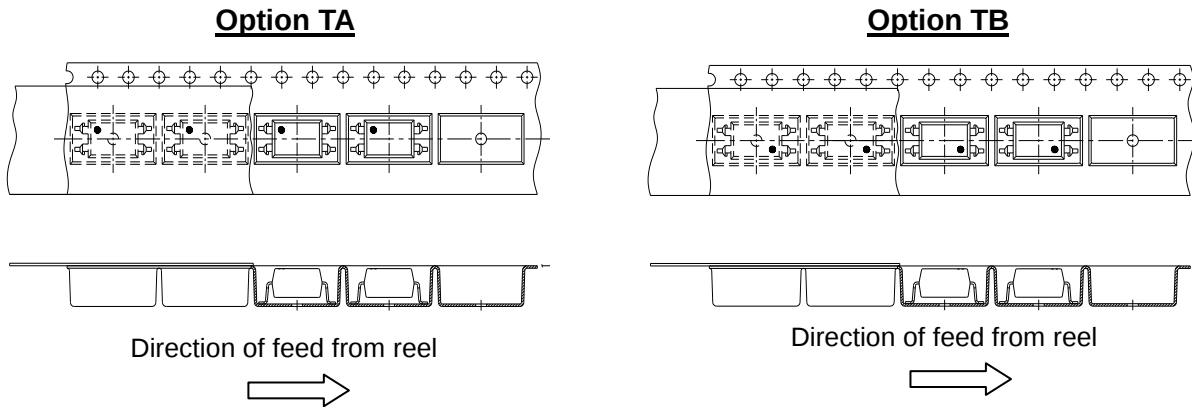
## Device Marking



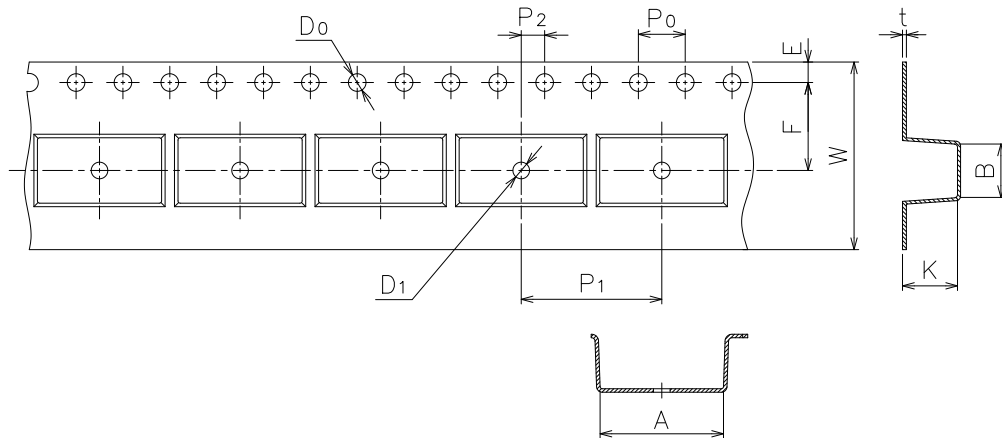
### Notes

EL denotes EVERLIGHT  
851 denotes Device Number  
Y denotes 1 digit Year code  
WW denotes 2 digit Week code  
V denotes VDE (optional)

## Tape & Reel Packing Specifications

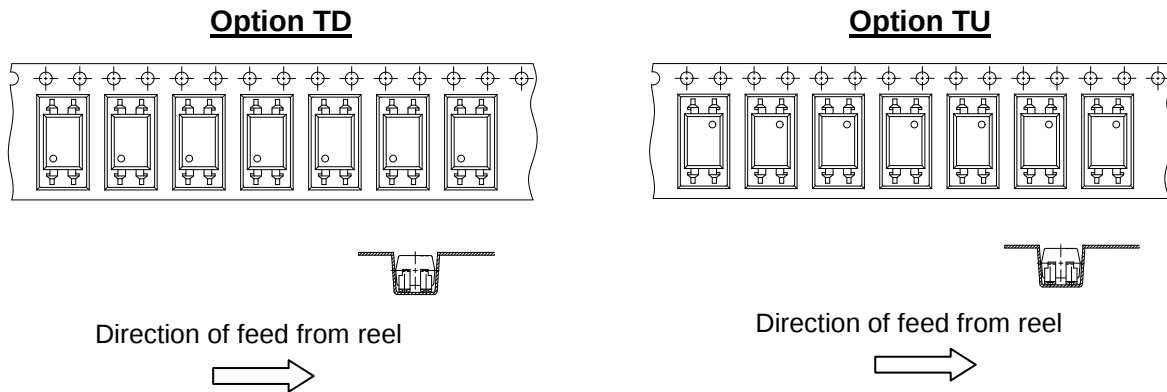


## Tape dimensions

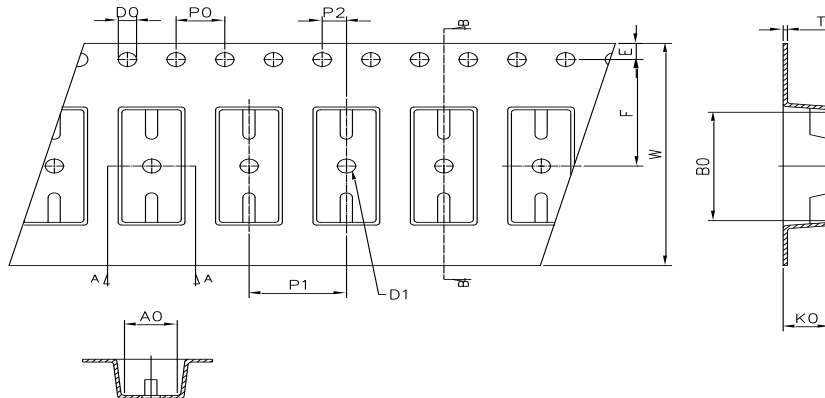


| Dimension No.        | A              | B              | D <sub>0</sub> | D <sub>1</sub> | E        | F        |
|----------------------|----------------|----------------|----------------|----------------|----------|----------|
| Dimension (mm)<br>S  | 10.7±0.1       | 4.65±0.1       | 1.5±0.1        | 1.50±0.1       | 1.75±0.1 | 7.5±0.1  |
| Dimension (mm)<br>S1 | 10.7±0.1       | 4.65±0.1       | 1.5±0.1        | 1.50±0.1       | 1.75±0.1 | 7.5±0.1  |
| Dimension No.        | P <sub>0</sub> | P <sub>1</sub> | P <sub>2</sub> | t              | W        | K        |
| Dimension (mm)<br>S  | 4.0±0.1        | 12.0±0.1       | 2.0±0.1        | 0.4±0.1        | 16.0±0.3 | 4.75±0.1 |
| Dimension (mm)<br>S1 | 4.0±0.1        | 12.0±0.1       | 2.0±0.1        | 0.4±0.1        | 16.0±0.3 | 3.90±0.1 |

## Tape & Reel Packing Specifications



## Tape dimensions

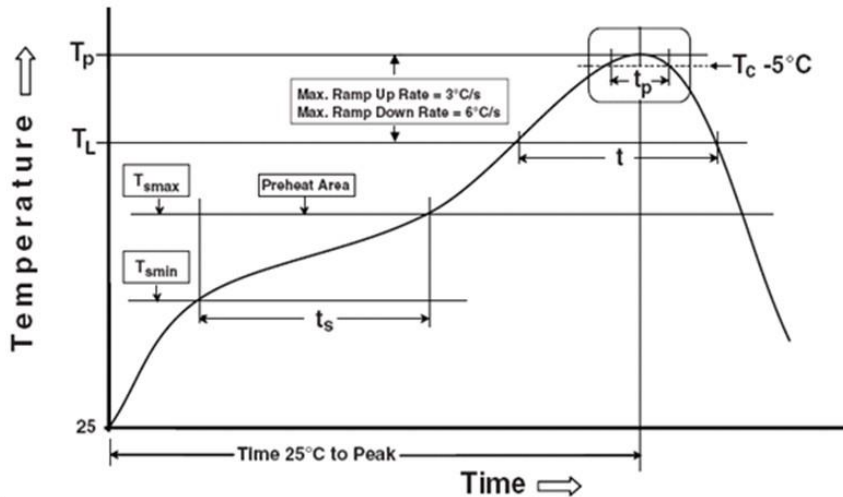


| Dimension No.  | <b>Ao</b> | <b>Bo</b> | <b>Do</b> | <b>D1</b> | <b>E</b>  | <b>F</b>  |
|----------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Dimension (mm) | 4.90±0.1  | 10.40±0.1 | 1.5±0.1   | 1.50±0.1  | 1.75±0.1  | 7.50±0.1  |
| Dimension No.  | <b>Po</b> | <b>P1</b> | <b>P2</b> | <b>t</b>  | <b>W</b>  | <b>Ko</b> |
| Dimension(mm)  | 4.00±0.1  | 8.00±0.1  | 2.00±0.1  | 0.40±0.1  | 16.00±0.3 | 4.60±0.1  |

## Precautions for Use

### 1. Soldering Condition

#### 1.1 (A) Maximum Body Case Temperature Profile for evaluation of Reflow Profile



Note:

Reference: IPC/JEDEC J-STD-020D

#### Preheat

|                                              |                 |
|----------------------------------------------|-----------------|
| Temperature min ( $T_{smin}$ )               | 150 °C          |
| Temperature max ( $T_{smax}$ )               | 200°C           |
| Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )  | 60-120 seconds  |
| Average ramp-up rate ( $T_{smax}$ to $T_p$ ) | 3 °C/second max |

#### Other

|                                                                      |                  |
|----------------------------------------------------------------------|------------------|
| Liquidus Temperature ( $T_L$ )                                       | 217 °C           |
| Time above Liquidus Temperature ( $t_L$ )                            | 60-100 sec       |
| Peak Temperature ( $T_p$ )                                           | 260°C            |
| Time within 5 °C of Actual Peak Temperature: $T_p - 5^\circ\text{C}$ | 30 s             |
| Ramp- Down Rate from Peak Temperature                                | 6°C /second max. |
| Time 25°C to peak temperature                                        | 8 minutes max.   |
| Reflow times                                                         | 3 times          |

## **DISCLAIMER**

1. Above specification may be changed without notice. EVERLIGHT will reserve authority on material change for above specification.
2. The graphs shown in this datasheet are representing typical data only and do not show guaranteed values.
3. When using this product, please observe the absolute maximum ratings and the instructions for use outlined in these specification sheets. EVERLIGHT assumes no responsibility for any damage resulting from use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets.
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